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# स्टेनलैस स्टील रेल मिल्क टैंक वैन — विशिष्टि

( पहला पुनरीक्षण )

## Stainless Steel Rail Milk Tank Van — Specification

( First Revision )

ICS 77.140.20

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## FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Dairy Products and Equipment Sectional Committee had been approved by the Food and Agriculture Division Council.

Rail milk tank vans are used to transport cooled, milk usually over long distances. The rail milk tank van broadly consists of milk tank with fittings, and railway underframe with its running gear and accessories. This standard covers the requirements for the tank with fittings only.

The milk tank van should suit the underframe according to the Rules and Regulations of the Indian Railways. The rail milk tank vans should be designed for movement by trains operating at high speeds as milk being a perishable product needs to be transported at higher speeds. The purchaser is also required to make arrangement for underframes, get the drawings of milk tank vans and axle loads approved by the Indian Railways and arrange to mount the tank on the underframes, through the Indian Railways. The overall dimensions of the rail milk tank vans with accessories shall not in any way infringe the 'Indian Railway Standard Schedule of limiting dimensions and clearances for broad gauge and metre gauge', in force from time to time.

This standard does not provide for the use of a canopy for the rail milk tank vans as it tends to be unhygienic and difficult to clean and does not serve any useful purpose. Moreover, it adds to the cost and reduces the capacity of the tanker as the outer dimensions are restricted by the Railways.

This standard was first originally in 1972 and the first revision has been brought out to update the material of construction and other requirements as per the latest advancements in the area. Further, in this revision, title of the standard has been modified as 'Stainless steel rail milk tank vans', specifications of 20 000 litre milk tank vans have been removed as these are no longer being manufactured/used and specifications of the milk tank van have been revised.

In the formulation of this standard, assistance has been derived from the valuable information received from Rail India Technical and Economic Service (RITES) Limited, Gurugram.

The composition of the Committee responsible for formulation of the standard is given in Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## Indian Standard

STAINLESS STEEL RAIL MILK TANK VAN — SPECIFICATION  
( First Revision )

## 1 SCOPE

1.1 This standard prescribes the requirements of tanks and fittings for rail milk tank vans with inner tanks fabricated from stainless steel.

1.2 This standard does not cover specification for railway underframe or its running gear or its accessories or any parts thereof.

## 2 REFERENCES

The following standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to

investigate the possibility of applying the most recent editions of these standards.

## 3 GENERAL DESCRIPTION

3.1 The milk tank van shall consist of the inner vessel, insulation, outer casing, fittings and mountings, and supports for mounting the milk tank on the underframe.

3.1.1 A typical general arrangement of rail milk tank van is shown in Fig. 1.

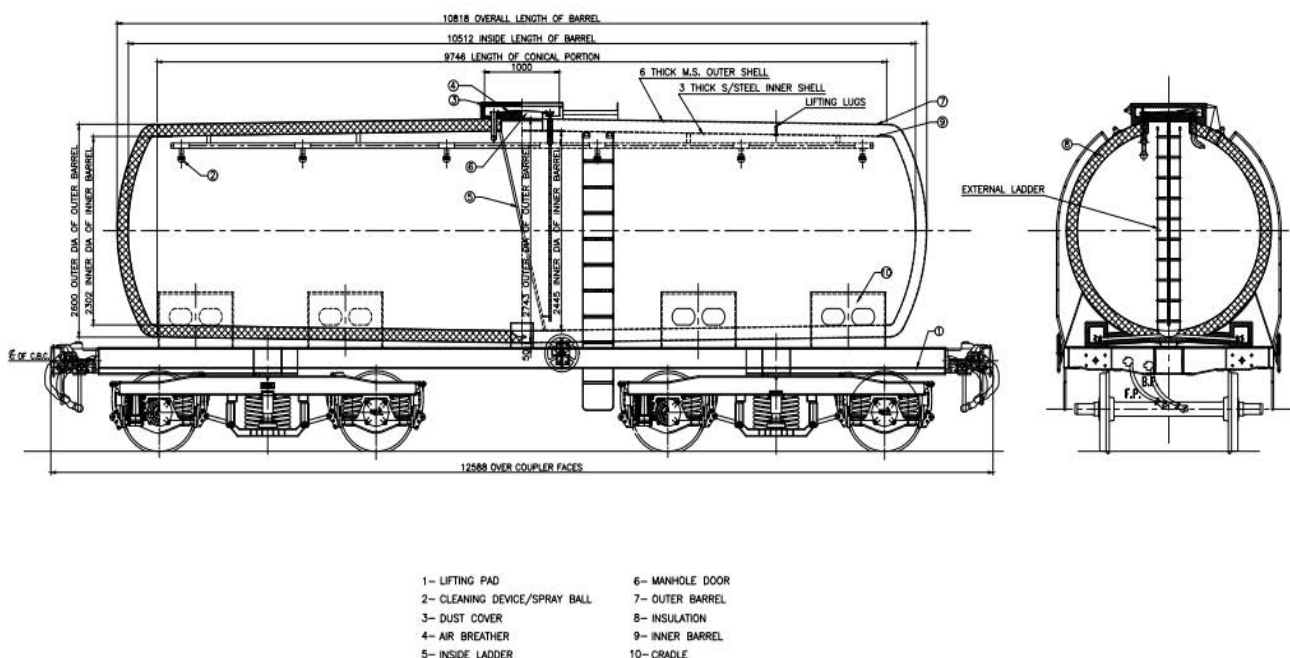


FIG. 1 TYPICAL GENERAL ARRANGEMENT OF TAIL MILK TANK VAN

## 4 CAPACITY

4.1 Nominal capacities of the rail milk tank van shall be minimum 40 000 litres.

4.1.1 The milk tank vans are recommended for broad gauge.

## 5 SHAPE

5.1 The inner vessel and outer casing shall be of horizontal cylindrical shape with dished ends. There shall be either a positive slope of at least 50 mm with semi-circular sanitary drainage channel or at least 140 mm without the channel from both ends to the drainage of the milk tank, where outlets are located to ensure complete draining of the contents of the milk tank. The diameters at the end

and at the centre of the inner tank shall differ by at least 140 mm to provide a positive slope towards the centre for drainage.

## 6 DIMENSIONS

The recommended dimensions of rail milk tank vans of nominal capacity of 40 000 litres and 44 660 litres are given in Table 1.

**Table 1 Recommended Dimensions of Rail Milk Tank Vans**  
(Clause 6)

| Sl No.   | Vessel                    | Nominal Capacity,<br>Litres   |                                 |
|--|---------------------------|-------------------------------|---------------------------------|
|  |                           | 40 000<br>(VVN*)<br>mm<br>(4) | 44 660<br>(VVNH1*)<br>mm<br>(5) |
| (1)  | (2)                       |                               |                                 |
| I)   | <i>Inner</i>              |                               |                                 |
|  | Inside dia at the centre  | 2 150                         | 2 445                           |
|  | Inside dia at the ends    | 2 000                         | 2 302                           |
|  | Inside overall length     | 12 416                        | 10 512                          |
| II)  | <i>Outer</i>              | mm                            | mm                              |
|  | Outside dia at the centre | 2 468                         | 2 743                           |
|  | Outside dia at the ends   | 2 318                         | 2 600                           |
|  | Outside overall length    | 12 800                        | 10 818                          |
| *VVN and VVNH1 are the transportation codes used by Research Design and Standards Organisation for the rail milk tank vans of nominal capacity 40 000 and 44 660 litres, respectively. |                           |                               |                                 |
| NOTE — The dimensions of the tank vans shall depend on thickness of insulation. These dimensions are based on 140 mm thick insulation.   |                           |                               |                                 |

## 7 MATERIAL

**7.1** The inner vessel, manhole rim, manhole door, outlets and outlet valves, pressure and vacuum relief valves and internal ladder, if any, shall be made of stainless steel conforming to a designation Austenitic X04 Cr19 Ni9 (*see* IS 5522, Grade 304).

**7.1.1** Pressure and vacuum relief valves may also be made of rubber conforming to the requirements prescribed in **7.4**.

**7.2** Outer casing (outer vessel) shall be made from Stainless Steel plates conforming to Grade 304 N (*see* IS 6911) or mild steel plates conforming to Grade E250 CuA (*see* IS 2062).

**7.2.1** The external ladder, tank supports, lifting hooks, hinges, bolts and nuts, etc. should be made from structural steel (*see* IS 2062).

### 7.3 Insulation

The insulation may be of poly urethane foam material having density of 45-50 kg/m<sup>3</sup> or any other superior material or of any other suitable insulating material. However, the quality and thickness of the insulating material shall be such as to prevent in 24 h a temperature rise of not more than 2 °C in the tank full of water when the difference between the

temperature of water and that of the atmosphere is not more than 35 °C. The insulating material should not be affected if the tank is sterilized by steam. The above temperature rise shall not take into consideration the sensible heat that may be stored in the empty tank at the time of filling. Before recording the temperature, the water shall be gently agitated to make the temperature uniform within the tank (*see* **12.2**).

**7.4** Material used for sealing shall be rubber of non-toxic, stable and non-absorbent quality and shall have smooth surface and shall not deteriorate when in contact with milk and cleaning agents. The rubber used should preferably be acrylonitrile butadiene copolymer (NBR) of type B3 or polychloroprene of type C3 of IS 6450.

## 8 THICKNESS

**8.1** In both types of milk tank vans, the minimum thickness of the mild steel as per Grade E250 CuA (*see* IS 2062) used for outer vessel shall be not less than 6 mm and outer dish-end thickness shall be 8 mm. The thickness of stainless steel as per Grade 304 N (*see* IS 6911) used for inner vessel shall be not less than 3.0 mm and inner dish-end thickness shall be 4 mm.

**8.1.1** The thickness of insulation shall be minimum of 100 mm.

## 9 FITTINGS

### 9.1 Manhole

A circular top manhole of a diameter not less than 550 mm shall be provided. The manhole cover shall be hinged to manway rim and be of quick release type. The cover shall be fitted with pressure and vacuum relief valves which are of easily cleanable type. The manhole shall also be provided with a dust cover of hinged and quick-release type. The dust cover shall be provided with a locking device.

**9.2** Dip Stick fixing arrangement made from stainless steel pipe of grade SS 304 N (*see* IS 6911) shall be provided inside the barrel.

### 9.3 Tank Supports

The saddles for mounting the tank shall be a part of underframe. In order to support the tank on the underframe saddles, cradle support shall be fabricated from IS 2062 plate and it must be directly welded with outer shell for anchoring the complete tank to the supports provided on the underframe. Thickness of plate shall be 12 mm minimum.

### 9.4 Outlets

Two outlets of diameter either 63.5 or 76.2 mm (*see* IS 3382) shall be located at the centre bottom of the tank with the discharge pipes of stainless steel with sufficient slope ending in 63.5 or 76.2 mm two-way valve of stainless steel of sanitary design. Outlet pipes shall be situated as near as possible to the outlet valves. Outlet valves shall be suitably housed in stainless steel boxes with padlock doors. Arrangements shall also be made for drainage of water from the boxes. The tank outlet and discharge pipe shall get proper mechanical turbulence of 1.5 m/s during clean-in-place cycle.

NOTE – Considering rail milk tank van to be horizontal tanks, turbulent flow during cleaning and sanitation shall be as per below formula:

$$V = 2 \pi r h \times 0.3 \times 3.8 \times 60$$

Where

$V$  = required flow rate, in KL/hr;

$r$  = radius of tank van, in feet;

$h$  = height of tank van, in feet;

3.8 = conversion factor for converting gallon to KL; and

60 = conversion factor for converting minute to hour.

### 9.5 Ladders

One internal vertical stainless steel ladder of flats on the vertical side and rods on the horizontal side shall be provided for getting into the tank. No hollow sections shall be used. Two mild steel ladders shall be provided on the outside of the tank one on each side with connecting platform of stainless steel for having easy access to the manhole portion.

### 9.6 Cleaning devices

The tank van shall have six removable cleaning devices/CIP spray ball of a design capable of cleaning the entire inside of the tank. CIP Spray Ball with 360 stationary is preferred. If rotary spray / rotary jet head type CIP spray balls are used, proper monitoring and inspection should be done to avoid the risk of accumulation of dirt due to jamming of spray balls. Periodic inspection and cleaning of the CIP headers shall be carried out.

**9.7** For lifting the milk tank, lifting hook on the top of outer vessel, two numbers at either end shall be provided.

## 10 CONSTRUCTION

**10.1** The inner vessel shall be of welded construction with all inner welds ground smooth and polished to sanitary dairy finish. All corners shall have a radius of not less than 25 mm (except the connection points between the inner and outer tanks at manhole, cleaning device, etc.) and ends other than those dished to shell, which shall have a radius of 6 mm. The ends shall be sufficiently stiffened in order to cope with the shunting and braking impacts. Adequate locking shall be provided between inner and the outer vessel to prevent relative movement between the inner and the outer vessels.

**10.2** On the outer surface of the inner vessel not less than 140 mm PUF injection or superior material shall be laid. All air space shall be eliminated.

**10.3** In case of non-fire-proof insulating material being used, the welding of the outer vessel, when carried out in position at the time of assembly, should be done with special precaution so that the insulating material is not damaged.

**10.4** The inner vessel and all attachments made from stainless steel shall preferably be welded by the inert gas arc-welding process using argon as the shielding gas. The filler rods and the bare electrodes for the process shall conform to grade 308L of IS 5856. The steel may also be welded by manual metal arc welding process using covered electrodes conforming to grade E 19.9 L of IS 5206.

## 11 FINISH

**11.1** All internal welds of inner vessel shall be ground smooth to 150 grit and all internal surfaces polished to a smooth finish.

**11.1.1** All welds of the outer casing, wherever accessible, shall be ground. Welds on tank supports shall be cleaned. All surfaces shall be painted with an anti-rust primer, using non-corrosive filler where required. Two final coats of synthetic enamel paint shall be applied on the outer casing. The colour of the paint shall be as approved by the Railways.

**11.1.2** All the welds on the outside surface of the inner vessel shall be suitably descaled.

**11.1.3** Inside of the outer casing shall also be given proper anti-corrosive treatment.

## 12 TESTS

**12.1** The inner vessel after grinding the welds and finishing the surface prior to the application of insulation shall be tested for water tightness by subjecting it to a hydraulic pressure of 0.35 kg/cm<sup>2</sup> for 5 min.

**12.2** Chilled water test shall be carried out to check the insulation performance. Water shall be stored at 4 °C or below for 24 hrs and checked for temperature rise (*see* 7.3)

**12.3** Radiographic test at the joints may be carried out as agreed to between the purchaser and the supplier (*see* IS 1182 and IS 4853).

**12.4** The quality of the welds shall be tested by the dye penetration method (*see* IS 3658) and the acceptance limits may be as agreed to between the purchaser and the supplier.

## 13 MARKING

**13.1** Each rail milk tank van shall be legibly and permanently marked with the following information:

- a) Manufacturer's name, trade-mark or initials;
- b) Year of manufacture; and
- c) Capacity of the tank van.

### 13.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

**ANNEX A**  
(Clause 2)

**LIST OF REFERRED STANDARDS**

| <i>IS No.</i> | <i>Title</i>  |  |
|---------------|---|--|
| 1182 : 1983   | Recommended practice for radiographic examination of fusion welded butt joints in steel plates ( <i>second revision</i> ) | 5206 : 1983 Specification for covered electrodes for manual metal arc welding of stainless steel and other similar high alloy steels ( <i>first revision</i> )                             |
| 2062 : 2011   | Hot rolled medium and high tensile structural steel — Specification ( <i>seventh revision</i> )                           | 5522 : 2014 Stainless steel sheets and strips for utensils — Specification ( <i>third revision</i> )   |
| 3382 : 1965   | Specification for stainless steel milk pipes and fittings   | 5856 : 2017/ISO Welding consumables — Wire electrodes, strip electrodes, wires and rods for arc welding of stainless and heat resisting steels — Classification ( <i>second revision</i> ) |
| 3658 : 1999   | Code of practice for liquid penetrant flaw detection ( <i>second revision</i> )   | 14343 : 2009   |
| 4853 : 1982   | Recommended practice for radiographic inspection of fusion welded butt joints in steel pipes ( <i>first revision</i> )    | 6450 : 1971 Specification for rubbers for the dairy industry   |
|               |   | 6911 : 2017 Stainless steel plate, sheet and strip — Specification ( <i>second revision</i> )  |

**ANNEX B**  
(Foreword)

**COMMITTEE COMPOSITION**

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| <i>Organization</i>  | <i>Representative(s)</i>  |
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### Amendments Issued Since Publication

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